

THE CHARACTER OF THE EVENING.

The following remarks by Mr. Lee A. Denison, observer, Weather Bureau, at Albany, in a letter dated September 27, 1897, are commended to the attention of all observers:

I have the honor to suggest that where two or more observers are serving on station the "Character of the evening," as in the case of the "Character of the day," be entered in the Daily Journal.

By the "Character of the evening" I refer especially to the general effect of the state of the weather, combined with starlight or moonlight, or both, upon the darkness and therefore on the sight of the traveler, pedestrian, and others, exposed at this period of the twenty-four hours. The length of time included in the term "evening" is from the end of twilight to midnight.

It can not be denied that a large percentage of accidents occur during the evening and a careful observation of the "Character of the evening" will be of great value when the records of the Bureau are produced before the several courts of the country.

It occurs to me that a scale, as in the case of cloudiness—0 to 10—somewhat similar to the following, might answer the purpose in describing and estimating the conditions as to darkness:

Clear with half to full moon	0
Clear with new to half moon	1
Partly cloudy with half to full moon	2
Partly cloudy with new to half moon	3
Cloudy, upper clouds, with half to full moon	4
Cloudy, upper clouds, with new to half moon	5
Clear with starlight	6
Partly cloudy with starlight	7
Cloudy, upper clouds, with starlight	8
Cloudy with starlight	9
Cloudy, rain, or fog, with starlight	10

It has been found impracticable to enforce the above suggestion upon all Weather Bureau stations, but it is so excellent that the Editor commends it for consideration by all.

CLIMATE OF LIBERIA.

Ever since 1871 the Weather Bureau has endeavored to collect data bearing upon the origin of our West Indian hurricanes, some of which have been traced backward to points near the African coast, so that it seems likely that these originated in that region. Instruction has been given and apparatus furnished to observers who contemplated living in Liberia in order to obtain and enter data upon the daily weather map of the Northern Hemisphere, but direct returns have been rare. Lately we have received from Prof. O. F. Cook a short climatological table, which adds considerably to the data in hand. Mr. Cook and his colleague, Mr. Collins, representing the University of Syracuse, N. Y., have spent a number of seasons in Liberia in the study of natural history. On the second expedition they landed in Monrovia, January 3, 1894, and left July 22. Their stay was divided between Monrovia and the experimental farm at Mount Coffee, whose summit is 320 feet above sea level. The following observations of temperature were apparently made on Mount Coffee, but as the whole region for twenty miles inland does not ascend to a greater height than 300 feet above the ocean it is probable that these fairly represent the climate of the lowlands near the coast. The tide in the St. Pauls River is appreciable up to the rapids near Muhlenberg Mission, 20 miles from its mouth. A permanent station was built by Messrs. Cook and Collins for their scientific work on Mount Coffee, 10 miles from the boat landing at White Plains and 140 feet above the level of St. Pauls River at that place. The following thermometric record is copied from pages 27-30 of the "Second Report of Prof. O. F. Cook to the Board of Managers of the New York State Colonization Society, October, 1894. John Bingham, Printer. New York City:"

Mr. Collins kept, when convenient, a record of the readings of the thermometer and hygrometer, from which the following table was made. It will be seen that the temperature, while never excessive, is constantly high. The season was generally considered to be a hot one, and the records cover the hot months of the year. The readings were taken in shaded, well ventilated locations, care being taken, however,

to protect the hygrometer from currents of air. The hygrometer columns give the difference in degrees between the wet and dry bulbs of a tested instrument.

The lowest temperature noted was 62°, registered at 7 a. m., January 20. The next day at the same hour the temperature was 68°. An attempt was made to get the temperature in the sun, but our thermometer registers only 115°.

Hour of reading.	Thermometer.				Hygrometer.				Rainfall, number of—	
	No. of readings.	Maximum.	Minimum.	Mean.	No. of readings.	Maximum.	Minimum.	Average.	Days.	Hours.
Jan., 9 a. m.	21	79	72	76.9	21	5	1	2	5	5
12-2 p. m.	23	85.5	79	82.6	23	10	2.5	4.7		
4-6 p. m.	22	82.5	73.5	80.7	22	5.6	2	3.6		
Feb., 9 a. m.	15	83	74	78.5	15	6	1	3.1	1	4
1-2 p. m.	15	86.5	78	83.9	15	10	1	6		
5-6 p. m.	14	83	77	81.2	14	5.5	2	3.1		
Mar., 9 a. m.	20	82.5	73	78	20	8	1	2.8	7	6
1-2 p. m.	12	89	80	86.7	12	6	5	5.3		
5-6 p. m.	11	83.5	79	81.4	11	4.5	2	3		
Apr., 9 a. m.	11	87	75.5	83.1	11	6	1	4	17	41½
1-2 p. m.	8	92	83	88.7	8	10	2	4.3		
5-6 p. m.	6	84	74	78.6	6	4	1	2.3		
May, 9 a. m.	9	84	72	79.2	7	5	5	2.8	16	35½
12-1 p. m.	13	93	74	83.5	12	6	1	3.6		
June, 9 a. m.	11	83	76	79.6	11	3	1	2.1		
12-2 p. m.	13	87	74.5	82.2	12	7	1	3.7	23	106½
5-6 p. m.	4	78	74	75.5	3	5	1	2.7		

THE RAINFALL AND OUTFLOW OF THE GREAT LAKES.

On pages 164-166 of the MONTHLY WEATHER REVIEW for April, 1898, the Editor has computed, for each of the Great Lakes, respectively, the available surplus of water, viz, the inflow from the upper lake, the direct rainfall plus the run off from the surrounding watershed less the annual evaporation, and has shown that the computed surplus decidedly exceeds the measured outflow. The excess is so large that it argues a corresponding uncertainty in all the data entering into the computation and fully confirms the conclusion expressed in the first report of the United States Deep Waterways Commission, viz, that every effort must be made to obtain better and more reliable data. To this end, in fact, the present United States Board of Engineers on Deep Waterways has been organized, and the following extracts from letters of G. Y. Wisner, C. E., a member of this Board, show the present condition of our knowledge of the subject:

Lake Erie.—The discharge into Niagara River for mean lake level will probably prove to be about 235,000 or 240,000 cubic feet per second (instead of 250,000, adopted on page 164).

Lake Superior.—The outflow, namely, the discharge through St. Marys River, was determined in 1895, by Mr. Haskell, as 72,600 cubic feet per second for mean lake level, instead of the 86,000 formerly adopted.

Lake Michigan plus Huron.—The discharge of the St. Clair River will probably be diminished proportionately, viz, about 10 or 12 per cent, reducing it from 225,000 to 200,000.

Lake St. Clair.—The discharge of Lake St. Clair, through Detroit River, will fall below 200,000 cubic feet per second for mean condition.

As regards the run off for Lake Superior, a fair estimate for the watershed is 40 per cent, as the country surrounding the lake is very rolling and rocky. For lakes Michigan, Huron, and Erie, 33 per cent is about right.

Adopting these values we have the following results:

Lake Superior.—Total supply 4.2 feet, total discharge 2.6 feet, leaving 1.6 foot for evaporation and errors in the estimates.

Lake Huron plus Lake Michigan.—Total supply 6.6 feet, total discharge 5.0 feet, leaving 1.6 foot for evaporation and errors in the estimates.

Lake St. Clair plus Lake Erie.—Total supply 27.8 feet, total discharge 25.5 feet (adopting 235,000 feet per second), leaving 2.3 feet for evaporation and errors in the estimates. Discharge for Lake Huron is probably less than 200,000, which would increase this excess by 20 per cent above the estimate for Lake Huron and decrease that for Lake Erie.

Nothing more definite can be hoped for until the final report of the engineers who are now at work on the physics of the lakes and waterways.

Evaporation is the most uncertain element in the solution of this problem, due to the fact that evaporation, as determined at observation

stations, in noways represents the true conditions on the lake surfaces during windy weather. The lake surface is increased to a considerable extent by wave action and the contact with constantly changing air and spray blown from waves make conditions which almost render the problem indeterminate.

Mr. Wisner adds:

The run off above given is that which, from a personal knowledge of the country, seems reasonable to me. The discharge of the St. Marys, 72,600, is, I think, very nearly correct. The discharge of the St. Clair River for mean conditions does not, in my opinion, exceed 200,000 cubic feet per second. In this connection I wish to call attention to the fact that the discharge of Lake Huron depends on both the stage in Lake Huron and in Lake St. Clair. Owing to the fluctuation of Lake Erie being greater than for Lake Huron, the minimum slope of the St. Clair River occurs at the high stage of the lakes, and the maximum slope at the minimum stage, a condition which has not been heretofore considered, and which plays an important part in the fluctuations of both lakes. The St. Clair River is only 750 feet wide at its head, and a large part of any change of slope is concentrated in the rapid at the foot of Lake Huron, which simply means that the maximum discharge is not necessarily at the maximum stage of Lake Huron.

We are now making additional observations for the discharge of Niagara River at a higher stage than when observations were made last fall, which may change the result obtained then.

I feel quite confident now that the discharge for mean stage will likely fall between 230,000 and 240,000 cubic feet.

OCEANIC AND SEISMIC NOISES.

The following extract from the English journal, *Nature*, for June 9, 1898, Vol. LVIII, page 130, is of interest in connection with the article on page 152 of the MONTHLY WEATHER REVIEW for April which was published almost simultaneously, and without knowledge of the Italian article referred to by our contemporary:

The mysterious phenomenon known as "Barisal guns," or "Mist poeffer," forms the subject of a useful paper by Dr. A. Cancani, in the last *Bollettino*, Vol. III, No. 9, of the Italian Seismological Society. The observations on which his discussion is founded are collected from places in or near the inland province of Umbria, where the noises are known as "marina," it being the popular belief that they come from the sea. The sound is quite distinct and easily recognized; it is longer than that of a cannon shot, and though more prolonged and dull, it is not unlike distant thunder. It invariably seems to come from a distance, and from the neighborhood of the horizon, sometimes apparently from the ground, but generally through the air. The weather, when the "marina" is heard, is calm as a rule, but that it often precedes bad weather is shown by the common saying, "Quando tuona la marina o acqualo vento o strina" (when the ocean thunders, expect rain or wind or heat). The interval between successive detonations is very variable, sometimes being only a few minutes or even seconds. They appear to be heard at all times of the day and year, the experience of observers differing widely as to the epochs when they are heard most frequently. With regard to the origin of the "marina," Dr. Cancani concludes that they can not be due to a stormy sea, because "mist-poeffer" are frequently observed when the sea is calm; not to gusts of wind in mountain gorges, for they are heard on mountain summits and in open plains. If their origin were atmospheric they would not be confined to special regions. Nor can they be connected with artificial noises, for they are heard by night as well as by day, and in countries where the use of explosives are unknown. There remains thus the hypothesis which Dr. Cancani considers the most probable, that of an endogenous origin. To the obvious objections that there should always be a center of maximum intensity, which is never to be found, and that they are so rarely accompanied by any perceptible tremor, he replies that, in a seismic series, noises are frequently heard without any shock being felt, and of which we are unable to determine the center.

ELECTRICAL STORMS IN KANSAS.

Mr. T. B. Jennings, Section Director of the Kansas Section of the Climate and Crop Service, reports that—

The western counties of that State are occasionally swept by a wind-storm, denominated by the plainsmen as an "Electrical storm," though no thunder or lightning occurs and the weather is generally clear; it is a broad wind, blowing with great force; a person exposed to it soon becomes filled with electricity, and on approaching a stove electric sparks will pass from his hands to the stove; the housewife wraps her hands up in rags to handle the stove utensils. It is difficult to realize the conditions in such a windstorm until one experiences them; the electrical conditions are not uniform but confined more to currents or streaks; growing grain and foliage on trees exposed to

these conditions become more or less scorched, and sometimes the grain crop is completely killed. Such winds (electric storm) are most frequently from the northwest.

The mountains of Colorado, and doubtless other parts of the country, frequently experience electrical storms that appear to be very similar to those described by Mr. Jennings. The wind blows severely from the west; the air is sometimes quite dry but more often filled with the finest forms of vapor condensation; a steady stream of electrical discharges flows from every sharp point, whether of rock, or plant, or dwelling; the observer feels a tingling and cooling sensation, precisely similar to that experienced when taking an electrical bath treatment, and hears the singing due to the thousands of discharges going on all around him. Occasionally our observers on Pikes Peak have had too intense an experience; flashes and balls of lightning have played all around them within the observing station and the iron stove has been ablaze with continuous electrical discharges, yet nothing serious occurred. On a neighboring summit the field party sent out by the Coast and Geodetic Survey, in 1893, (?) reported far more serious storms of several hours' duration on successive days, entirely preventing work and injuring the instruments.

It is not yet satisfactorily ascertained whether the electricity of such storms originates in the earth or in the atmosphere or in the space beyond. If the latter, then we may trace it to the sun; if it comes from the air, we must attribute the origin of the electricity to some peculiarity in the processes of evaporation and condensation; if it comes from the earth, then it must originate in the compressions and shocks and friction that attend earthquakes and the outflow of lava. We do not see our way clear to indorse the popular idea that the electricity is generated by the wind or by the friction of particles rolled along by the wind, or by the melting of snow crystals, as suggested by Mr. Couch. In fact, the problem is evidently too difficult for our present limited knowledge.

The first step to be taken in investigating the true nature of these electric storms must consist in a collection of data showing the places and dates of their occurrence, and the collection must be sufficiently exhaustive to show when and where they do not occur as well as where they do. It is also necessary to distinguish between the injury done to plants by electricity and that done by the drought and the evaporation that accompany hot, dry winds in Kansas and the western plains. Reports of the occurrence of these storms will be very acceptable. A graphic account of the storm of October 27, 1894, is given on p. 120, *American Meteorological Journal*, Vol. XII, August, 1895.

METEOROLOGICAL SUPERSTITIONS.

The tendency of mankind to regard any unusual meteorological phenomenon as a special message from on high, announcing the speedy occurrence of some event of importance either to the individual or to the whole human race, is well illustrated by a note in the April report of Mr. Earl Flint, at Rivas, Nicaragua. With reference to the halo recorded by him on April 26, he says: "Many called my attention to the halo as they saw three extra suns. Last year for a similar occurrence at St. George the town was called out, believing it a forerunner of some calamity; but here at Rivas, they made it the precursor of the earthquake."

An inclosed slip from the *Managua Daily* gives a long series of connections between halos and both good and bad events in the history of the world. Of course, any one familiar with chronological tables could pick out a thousand more such coincidences without demonstrating any connection between halos and the history of the human race further than the general principle that remarkable events are continually occurring both in the heavens and on the earth, and that an